REMARKS/ARGUMENTS

I. Introduction

This amendment is submitted in response to the Office Action dated October 3, 2005.

The specification has been amended to correct the errors identified by the Examiner.

Claims 1, 2, and 7 have been canceled without prejudice or disclaimer. **Accordingly, Claims 3-6 and 8-23 are now pending.**

Claims 3, 4, and 8 have been re-written in independent form, as they were dependent on canceled claims. No new matter has been added to these claims.

Claims 1, 6, 7, 9, and 18 stand rejected under 35 U.S.C. 112 as being indefinite. Claims 1 and 7 have been canceled, and claims 6, 9, and 18 have been amended to overcome this basis of rejection.

Claims 1-9, 10-12, 14-16, and 18-22 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,424,620 to Nishihara (hereinafter "the Nishihara patent"). In addition, claim 13 stands rejected under 35 U.S.C. 103(a) as being unpatentable over the Nishihara patent in view of U.S. Patent No. 5,309,431 to Tominaga et al. (hereinafter "the Tominaga et al. patent"). Additionally, claim 17 stands rejected under 35 U.S.C. 103(a) as being unpatentable over the Nishihara patent in view of U.S. Patent No. 5,706,279 to Teraslinna (hereinafter "the Teraslinna patent"). Finally, claim 23 stands rejected under 35 U.S.C. 103(a) as being unpatentable over the Nishihara patent in view of U.S. Patent No. 6,865,185 to Patel et al. (hereinafter "the Patel et al. patent).

Applicant will now address and overcome each of the Examiner's rejections after summarizing the invention.

II. Summary of the Invention

The present invention is directed to a system for providing an anti-flooding flow-control mechanism for use in defending against flooding Denial of Service attacks. Embodiments of the invention utilize traffic baseline generation, dynamic buffer management, and early traffic regulation. Baseline statistics on the flow rates for flows of data corresponding to different classes of packets are generated. When a router senses congestion, the router may drop certain traffic based on the flow rate of that class of traffic compared to the baseline rate for that class, as well as whether the traffic is responsive to flow control signals. Further, the system may cause notification to nodes upstream of the congested node, so that the upstream nodes can restrict traffic flow based on class of traffic before it is sent along to the affected (congested) node. This may be accomplished by the congested node requesting routing information from the destination node in order to determine which nodes are upstream of the congested nodes, and then sending a traffic control signal to the upstream node.

Another aspect of some embodiments of the invention wait for congestion to occur over a pre-selected period of time before dropping traffic at or destined for the node.

III. The Rejection of Claims 1-9, 10-12, 14-16, and 18-22 under 35 U.S.C. §102(e) Based on the Nashihara patent

Claims 1-9, 10-12, 14-16, and 18-22 stand rejected under 35 U.S.C. §102(e) as being unpatentable over the Nashihara patent.

In contrast to the present invention, the Nishihara patent utilizes a Network Monitor to determine where congestion in an ATM network is occurring, and which nodes in the network need to cut back on traffic flow to alleviate the congestion (see col.

7, lines 49-55). In no case does the Nishihara patent teach purposely dropping traffic at the congested node, as is taught in the present invention. The Nishihara patent discloses restricting traffic at a source edge device if there is congestion at a destination edge device (see col. 9, lines 41-52), and re-routing traffic around a congested node device within the ATM network (see col. 9, lines 62-67).

Another critical difference between the Nishihara patent and the present invention is that the Nishihara patent immediately responds to a congestion situation (see col. 9, lines 37-40), whereas the present invention includes embodiments that wait to see whether a congestion situation remains for a prescribed period of time before taking action, in order to avoid dropping traffic due to a transient situation.

Still another critical difference between the Nishihara patent and the present invention is that routing of congestion information in the Nishihara patent is accomplished by sending packets from source to destination, and reply packets from destination to source, wherein a portion of the packet contains flow rates, and intermediate nodes intercept these packets and may modify the data in order to accomplish flow control (see col. 9, lines 26-67). In contrast, the present invention utilizes the node that is experiencing a congestion problem to request from the destination node the identity of the paths leading to the destination node, including upstream nodes from the congested node. Once these upstream nodes are identified, the congested node can send requests to the upstream nodes to restrict traffic toward the congested node.

Claims 1&2: Claims 1 and 2 have been canceled.

Claim 3: Claim 3 has been amended to incorporate canceled claims 1 & 2, but has not otherwise been altered. Claim 3 as amended discloses "transmitting a signal to said destination device requesting path information." As discussed above, there is no teaching or suggestion in the Nishihara patent to request path information from the destination device. The Nishihara patent utilizes an "RM packet" and a "BRM packet" to signal congestion and these packets "are transferred being relayed by the respective node

devices 25-1 . . . 25-N according to the destination information, in the same way as a user packet" (col. 9, lines 31-33). Each node uses a table to determine which next node to forward the packet to based on the destination node identification. Therefore, claim 3, as amended, is not taught or suggested by the Nishihara patent, and is therefore respectfully submitted to be patentable over the cited art.

Claim 3 (as amended) states:

3. A packet flow control method comprising the steps of:
detecting congestion in a first node along a packet flow path between a source device and a destination device;
identifying a node in said path preceding said first node, wherein said step of identifying a node in said path **includes the step of transmitting a signal to said destination device requesting path information**; and
transmitting to said preceding node a traffic regulation signal used to initiate flow rate control on flows identified from information included in said traffic regulation signal, wherein said information included in said traffic regulation signal includes a destination address.

Claims 4-6: Claim 4 has been amended to incorporate canceled claims 1 & 2, but has not otherwise been altered. Claim 4 as amended discloses "monitoring to detect when said first node is saturated with packet traffic for a preselected period of time". As stated above, the Nishihara patent does not detect whether saturation of packet traffic **continues over a period of time**, but simply judges whether saturation is present, and acts on such notification.

The Examiner states on p. 5 regarding claim 4: "It is inherent (as disclosed by Tominaga et al. (U.S. Patent No. 5,309,431) in the same field of endeavor in column 18, lines 30-33) that an average flowing speed is computed over a preselected period of time where speed can be determined to be number of RM packets in the preselected period of time)." Applicant agrees with the Examiner on this point. The way to judge "saturation" or "average flowing speed" is to count occurrences for an "inherent" period of time. Applicant in the present invention also computes "current data flow rates" (see p. 5, lines

24-27 of the specification) by counting the traffic over an "inherent" time period (i.e.; one second). However, unlike the Nishihara patent, the present invention goes on to determine whether or not "saturation" (which is determined by counting the traffic over an inherent time period) **persists** over an additional **explicit** pre-selected time period.

Therefore, applying the Examiner's analysis, the Nishihara patent discloses measuring traffic over a single (inherent) time period (to determine "saturation"). Conversely, applicant discloses using two time periods; one (inherent) to determine "saturation", and the second (an explicit pre-selected period of time) to determine whether the **saturation persists** over that pre-selected time period. This distinction is clearly spelled out and explained in the specification at p. 24, lines 9-20 which state (emphasis added):

*In one particular embodiment, the congestion decision of step 504 is made based on **two conditions** to reduce false positives, the first condition is that the summation of **total bandwidth shares at the node must saturate the node** and second, the **saturation condition must persist for a window period after the saturation condition initially occurs**. In such an embodiment, congestion is declared in step 504 when the two conditions are met. Congestion is no longer found to be present when the saturation condition ceases to be encountered for the set period of time in which it was required to occur before congestion was declared.*

To sum up, the Nishihara patent requires only one saturation condition to exist before remedial steps are taken, and the claims 4-6 require that two conditions exist before such steps are taken. Therefore, claim 4 is not rendered unpatentable by the Nishihara patent, nor are claims 5 & 6 which depend from claim 4. Claim 4, as amended, states:

4. A packet flow control method comprising the steps of:

detecting congestion in a first node along a packet flow path between a source device and a destination device, including the steps of **monitoring to detect when said first node is saturated with packet traffic for a preselected period of time**;

identifying a node in said path preceding said first node, and

transmitting to said preceding node a traffic regulation signal used to initiate flow rate control on flows identified from information included in said traffic

regulation signal, wherein said information included in said traffic regulation signal includes a destination address.

Further, claim 6 has the additional limitation that an **additional** preceding node is signaled to restrict traffic flow downstream. There is no teaching or suggestion in the Nishihara patent to notify **two** preceding nodes to restrict traffic. As discussed above, the Nishihara patent discloses either notifying a source edge device to restrict traffic to alleviate congestion at a destination edge device (outside blocking), or re-routes traffic around a node within the ATM network (inside blocking). The device which signals these activities is the network monitor device, which is not a "preceding node" in any sense, as it is not in the communications path, and is connected to all of the network nodes.

Claim 6, as amended, recites:

6. The method of claim 5, further comprising the steps of:
operating said preceding node **to transmit an additional traffic regulation signal to an additional preceding node to cause the additional preceding node to initiate flow rate control on flows directed to a destination address identified in said additional traffic regulation signal.**

Claim 7: Claim 7 has been canceled.

Claim 8-9: Claim 8 discloses performing a forced reduction in the flow rate at the "first node". The first node is the node experiencing congestion. As discussed above, the Nishihara patent does not teach or suggest restricting traffic flow at the congested node. It only discloses steps to be taken **at other network nodes** to reduce traffic flow **to** the congested node. Specifically, the destination edge device is the node experiencing congestion for "outside blocking", and the source edge device limits the traffic flow, according to the Nishihara patent (see col. 9, lines 41-52). For "inside blocking", a node device (25-1 . . .25-N) in the ATM network experiences the congestion, and again the **source edge device** limits the traffic flow by changing the path (see col. 9, lines 62-67).

Therefore, claim 8, and claim 9 which depends therefrom, are not rendered unpatentable by the Nishihara patent. Claim 8, as amended, states:

8. A packet flow control method comprising the steps of:
detecting congestion in a first node along a packet flow path between a source device and a destination device;
operating the first node to perform a forced reduction in the flow rate of at least one packet flow in response to detecting traffic congestion;
identifying a node in said path preceding said first node,
transmitting to said preceding node a traffic regulation signal used to initiate flow rate control on flows identified from information included in said traffic regulation signal, and
operating said preceding node to perform a forced reduction in the flow rate of at least one packet flow in response to detecting traffic congestion.

Additionally, claim 9 contains the added limitation of performing the traffic reduction at the upstream node is a function of **a base line flow rate**. As discussed above, this relates to a historic analysis of traffic of that type in a similar time period over recent history. Conversely, the Nishihara patent teaches performing the reduction in flow rate according to the **capacity (vout)** of the path from the terminating edge device to the destination node (see col. 8, lines 43-45). There is no teaching or suggestion in the Nishihara patent to utilize **historic** traffic rates (base line flow) to determine how to restrict traffic at an upstream node. Claim 9, as amended, states:

9. The method of claim 8,
wherein the forced reduction in the flow rate performed in the first node **is performed as a function of a base line flow rate for traffic flowing through the first node**; and
wherein the forced reduction in the flow rate performed in the preceding node is performed **as a function of a base line flow rate for traffic flowing through the preceding network node**.

Claims 10-12 and 14-16: For the reasons stated above regarding claims 4-6, claims 10-12 and 14-16 are not rendered unpatentable over the Nishihara patent. Claim 10, and claims 11-12 and 14-16, which depend therefrom, require saturation to occur **over a specified time period**, which is not taught or suggested by the Nishihara patent.

Claim 10 recites:

10. A method of implementing flow control in a communications network including a first node, a second node and a destination node, the first node being located upstream of the second node on a communications path to said destination device, the method comprising the steps of:

operating the second node to **detect when the second node is saturated with traffic for a period of time**;

in response to **detecting that said second node is saturated with traffic for said period of time**, operating the second node to send a first traffic regulation signal to the first node to trigger said first node to perform traffic regulation of flow rates on flows of packets directed to said destination device.

Claims 18-22: Claim 18 discloses "a first network node including: . . . .ii. traffic flow path determination means **for determining the path of at least one packet flow causing congestion at said first network node**". Further, the **first network node** contains "means for transmitting a traffic regulation signal to initiate traffic regulation at an upstream network node".

In contrast, the Nishihara patent does not teach or suggest having the congested node determine the path of any packet flows. As discussed above, each network node in the Nishihara patent routes its packets according to stored tables (see col. 9, lines 30-33), and there is no teaching, or reason to, have the congested node determine the paths of any traffic flows. An RM packet is sent from the origination node to the termination node, and a BRM packet is returned along the reverse path, according to normal traffic routing techniques.

Further, the Nishihara patent discloses utilizing data blocks within the RM and BRM packets which are stripped off, read, and possibly changed by subsequent nodes along the traffic path to indicate congestion situations. In contrast, the present invention discloses utilizing the congested node to identify an upstream node, and to **transmit a traffic regulation signal** to that node to initiate traffic regulation at that node.

For these reasons, claim 18, and claims 19-22 which depend therefrom, are not rendered unpatentable by the Nishihara patent. Claim 18, as amended, states:

18. A communications system for communicating information as flows of packets, the system comprising:

a first network node including:

i. congestion control means for detecting congestion at said first network node;

ii. **traffic flow path determination means for determining the path of at least one packet flow causing congestion at said first network node**; and

iii. **early traffic regulation signaling means for transmitting a traffic regulation signal to initiate traffic regulation at an upstream network node**; and

an upstream network node, the upstream network node being coupled to the first network node, the upstream network node including:

i. means for receiving traffic regulation signals from said first network node; and

ii. flow control means for performing flow rate reduction operations on one or more traffic flows identified from information included in received traffic flow control messages.

IV. The Rejection of Claim 13 under 35 U.S.C. §103(a) Based on the Nashihara patent in View of the Tominaga et al. Patent

The Tominaga et al. patent discloses a route regulating apparatus which classifies traffic by "routes", associates the routes with "transmission lines", and when congestion is detected on a transmission line, notifies other nodes to regulate traffic on that transmission line (see Abstract). There is no teaching, nor does the Examiner allege such, of detecting "saturation for a preselected period of time" (claim 13). There is also no teaching of a node "receiving path information" from another node identifying a node which is on the "path of the flow causing congestion." In the Tominaga et al. patent, "each node 402 can retrieve the route to be regulated at high speed and with ease only by looking up the route information table TBL1" (col. 14, lines 63). Finally, there is no teaching in the Tominaga et al. patent to "operate the second node to detect when the second node ceases to be saturated with traffic **after being saturated for said period of time**" (claim 13). The Tominaga et al. patent simply detects when the "congested state of the transmission line is dissolved" and "transmits the same information indicating that the

congested state in the transmission line is cancelled through the common channel signaling unit" (col. 13, lines 48-61).

Therefore, no combination of the Nishihara patent and the Tominaga et al. patent teach either "operating the second node to detect when the second node is saturated with traffic **for a period of time**", or "operating said second node to receive path information identifying said first node as part of said path of the flow causing congestion", or finally, "operating the second node to detect when the second node ceases to be saturated with traffic **after being saturated for said period of time**." Therefore, based on the above, and that claims 10, 11, and 12 on which claim 13 depends are also not rendered unpatentable over the cited reference (see arguments above), claim 13 is patentable.

Claim 13 states:

13. The method of claim 12, further comprising:
operating the second node to detect when the second node ceases to be saturated with traffic **after being saturated for said period of time;**
in response to the second node detecting that has ceased to be saturated with traffic, sending a second traffic regulation message to said first node to cause said first node to cease traffic regulation of flow rates on flows of packets directed to said destination device.

V. The Rejection of Claim 17 under 35 U.S.C. §103(a) Based on the Nashihara patent in view of the Teraslinna patent

The Teraslina patent discloses methods and systems for controlling a flow of packets in a fast packet switching network by analyzing a parameter indicative of bandwidth usage associated with an endpoint. The flow of packets being forwarded to the endpoint is inhibited when the parameter violates a predetermined threshold (Abstract).

First, claim 17 is patentable, as it is dependent on other patentable claims (10, 11, 12, 14, and 16). The Examiner does not allege, nor is there any teaching in the Teraslina patent that would render any of the base claims 10, 11, 12, 14, and 16 unpatentable.

However, the Examiner finds that the Teraslina patent distinguishes between "packet flows corresponding to protocol types which are responsive to congestion control signals and packet flows corresponding to protocol types which are not responsive to congestion control signals." There is no such teaching in the reference.

The Teraslina patent teaches aggregating packets according to the source endpoint, found in the header (see col. 6, lines 35-39). The patent then discloses determining "if at least one of the bandwidth parameters is in violation of the traffic contract, then the packet is discarded" (see col. 6, lines 44-46). There is no teaching of identifying "protocol types which are responsive to congestion control signals", and in fact there is no teaching of identifying congestion. There is simply a way of enforcing bandwidth parameters in traffic contracts, which may or may not lead to congestion.

Therefore, for the reasons stated above, claim 17 is not rendered unpatentable by any combination of the cited references.

VI. The Rejection of Claim 23 under 35 U.S.C. §103(a) Based on the Nashihara patent in view of the Patel et al. patent

The Patel et al. patent discloses methods and systems for queuing traffic in a wireless network (Abstract).

First, claim 23 is patentable, as it is dependent on other patentable claims (18, 19, 20, 21, and 22). The Examiner does not allege, nor is there any teaching in the Patel et al. patent that would render any of the base claims 18, 19, 20, 21, and 22 unpatentable over that reference. However, the Examiner finds that the Patel et al. patent discloses "one packet queue being used to store packets corresponding to a single or each group of flows to which are to be subject to different flow rate reduction operations" (p. 16, No. 9). Not only does the Patel et al. patent not describe "queues corresponding to flow rate reduction operations", but the patent states: "flows are aggregated into groups based on location, radio frequency (RF) interference and/or other characteristics of the flows" (col. 3, lines 18-21).

Therefore, for the reasons stated above, claim 23 is not rendered unpatentable by any combination of the cited references.

VII. Conclusion

Claims 3-6 and 8-23, as amended, are not rendered unpatentable by any combination of the cited references, and therefore it is respectfully submitted that they are in condition for allowance.

In view of the foregoing amendments and remarks, Applicant respectfully submits that the pending claims are in condition for allowance. Accordingly, Applicant requests that the Examiner pass this application to issue.

If there are any outstanding issues which need to be resolved to place the application in condition for allowance the Examiner is invited to contact Applicant's undersigned representative by phone to discuss and hopefully resolve said issues. To the extent necessary, a petition for extension of time under 37 C.F.R. 1.136 is hereby made, the fee for which should be charged to Patent Office deposit account number 07-2347.

Respectfully submitted,

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